

ADAPTER DEVICE FOR PROJECTILE LAUNCHED FROM A LAUNCHING  
TUBE

5 DESCRIPTION OF TECHNICAL DOMAIN

The invention concerns an adapter device for use in association with a projectile with deployable fins, such as a missile, to allow such a projectile to be fired from a launching tube of small diameter, such as  
10 a mortar or cannon tube.

The invention especially enables projectiles guided by optical fibres, or the like, to be fired from a launching tube of standard dimensions, without having  
15 to modify the latter.

PRIOR ART

As evident especially from the document US- A-4 907 763, it is known to fire a projectile guided by a cable  
20 or an optical fibre, from a mortar or cannon tube.

In this case, the projectile is guided in flight by deployable fins which lodge before firing in recesses provided for this purpose in the external envelope of  
25 said projectile. This arrangement implies mounting the fins on the envelope by means of complex articulated mechanisms. In addition, the presence of recesses in the external envelope of the projectile results in a reduction in the useful volume available inside the  
30 envelope of the projectile..

## DESCRIPTION OF THE INVENTION

The object of the invention is an adapter device designed to allow a projectile such as a missile to be launched from a standard launching tube of small diameter, such as a mortar or cannon tube, without modification to said tube and without the necessity for housings or complex articulations for mounting the guide fins on the external envelope of the projectile.

10 According to the present invention, this result is obtained by means of an adapter device designed to be interposed between a projectile, fitted with deployable fins, for occupying a folded position, and a standard launching tube, said device being characterised in that  
15 it comprises a retaining ring for being mounted on an open end of the launching tube, an adapter tube for being placed around the projectile, such that in their folded position the fins are lodged in a first part of the adapter tube, and hooking means of the adapter tube  
20 on the retaining ring, in a position such that the first part of the adapter tube is located outside the launching tube and a second part of the adapter tube is received in the launching tube.

25 Utilisation of the adapter device according to the present invention allows projectile fitted with deployable fins to be fired from a standard launching tube whereof the internal diameter is slightly greater than the internal diameter of the body of the  
30 projectile, without it being necessary to modify the launching tube. In effect, the retaining ring mounted

on the launching tube serves to anchor the hooking means of the adapter tube in which the projectile is placed. Mounting of the retaining ring on the launching tube can especially be completed by friction, by giving  
5 said ring the form of a split ring which is clamped by means of a bolt interposed between its ends. The folded fins of the projectile are received in the part front of the adapter tube, which acts as guidance for the projectile when launched.

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According to a preferred embodiment of the invention, the first part of the adapter tube comprises longitudinal guide grooves terminating inside the adapter tube, so as to be capable of receiving each of  
15 the fins of the projectile.

In this case, the first part of the tube advantageously comprises longitudinal external grooves and each of said longitudinal guide grooves is formed in the  
20 corresponding one of said longitudinal external grooves.

According to an advantageous realisation of the invention, the first part of the tube comprises an  
25 external ring adjacent to the second part of the adapter tube and capable of being supported against an open end of the launching tube.

Advantageously, the hooking means are then interposed  
30 between the retaining ring and the external ring of the adapter tube.

In this case, the hooking means can especially comprise dunking mechanisms.

- 5 According to an advantageous refinement, the device also comprises mobile transport elements including a front protective cap and a back protective cap, suitable for being placed respectively on the front and back ends of the projectile covered by the adapter  
10 tube, and a transport sling connecting said protective caps.

- Preferably, an open end of the adapter tube, opposite the second part of the latter, is provided for placing  
15 behind auxiliary propulsion units of the projectile.

Advantageously, the projectile is a missile guided by an optical fibre.

- 20 In this case, the adapter tube generally comprises a closed end, opposite the first part of the latter, and a pulley for returning the optical fibre, mounted inside said closed end.

- 25 Finally, the launching tube is advantageously a mortar tube.

#### BRIEF DESCRIPTION OF THE DRAWINGS

- A preferred embodiment of the invention will now be  
30 described, by way of illustrative and non-limiting example, with reference to the attached diagrams, in

which:

Figure 1 is a perspective view showing a projectile to be launched from a launching tube, an adapter device according to the present invention being interposed  
5 between the projectile and the tube;

Figure 2 is a view in longitudinal section on a larger scale, showing especially the fins of the projectile taken up in grooves provided for this purpose in the adapter tube; and

10 Figure 3 is a side elevation schematically showing the protective caps and the transport sling of the projectile place in its adapter tube.

#### DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

15 In the overall description, the terms "front" and "back" are a reference respectively to the front and the back of the projectile placed in the launching tube by means of the adapter device.

20 As is illustrated schematically in Figure 1, the invention concerns an adapter device 10 provided to be interposed between a projectile 12 such as a missile guided by an optical fibre and a standard launching tube 14 such as a mortar tube, so as to enable the  
25 projectile 12 to be launched without the necessity of modifying the launching tube.

More precisely, the projectile 12 comprises a cylindrical body on which are articulated fins 16  
30 (figure 2) suitable for occupying a folded position illustrated in full lines and a deployed position (not

shown). In the non-limiting embodiment shown in the figures, there are four fins 16, evenly spaced on the circumference of the body of the projectile. Each of the fins 16 is plane and situated in a plane passing  
5 through the longitudinal axis of the body of the projectile.

Relative to its axis of articulation 18 on the body of the projectile, each fin 16 is suited to be folded to  
10 the front of the projectile 12, such that its edge turned to the front when the fins are deployed abuts against the circumferential surface of the body of the projectile when the fins 16 are folded.

15 As is also evident from Figure 1, the projectile 12 also comprises trimming propulsion units 18 (for example two) which join on the circumferential surface of the body of the projectile, at the front of the fins 16 when the latter are in the folded position.

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As indicated above, the projectile 12 is guided by an optical fibre 20 utilised, in a known manner, to ensure the transmission of information between said projectile and a command post (not shown), after the projectile  
25 has been launched.

The optical fibre 20 is stored on a bobbin 21 placed in the back part of the body of the projectile 12. It exits from said body via a central orifice formed on  
30 the back face of the latter. The optical fibre 20 then travels along the internal wall of the tube 14 or

outside the body of the projectile 12, according to a trajectory which will be specified hereinbelow, before emerging via the open end of the launching tube 14 to rejoin the command post.

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The adapter device 10 according to the present invention essentially comprises a retaining ring 22, provided to be fixed on the open end of the launching tube 14, an adapter tube 24 designed to be placed  
10 around the body of the projectile 12 and hooking means 26 of the adapter tube 24 on the retaining ring 22.

The retaining ring 22 is provided to be fixed by clamping on the launching tube 14, in the immediate  
15 vicinity of its open end, without having to modify or machine said tube. Thus, the retaining ring 22 can especially be a split ring whereof the ends can be joined to one another by a rapid clamping device such as a bolt 28. The effect of the clamping of the bolt 28  
20 is to secure the retaining ring 22 of the end of the launching tube 14 by friction. On its external surface the retaining ring 22 carries a part of the hooking means 26 for immobilising the adapter tube 24 relative to said ring when a ensemble of projectile 12 and  
25 adapter tube 24 is placed on the launching tube 14. In the embodiment show by way of example in the figures, said part of the hooking means 26 comprises two dunking mechanisms 30 mounted in emplacements diametrically opposite on the surface external of the retaining ring  
30 22.

As shown in Figure 1, the adapter tube 24 is a tube having a length slightly less than that of the projectile 12 and whereof the internal diameter is uniform and slightly greater than the external diameter of the body of the projectile. The end front of the adapter tube 24 is open while the back end of said tube is closed by a base 32.

Therefore, the adapter tube 24 can be placed around the body of the projectile 12, such that the front end of the projectile 12 projects over a certain length over the open front end of the adapter tube 24. The back end of the projectile 12 is then situated inside the adapter tube 24, at a certain distance from the base 32 of said tube. The latter distance is determined by an external ring 34, an integral part of the adapter tube 24, coming to rest against the open front end of the launching tube 14.

As shown in Figure 1, this arrangement enables a pulley 36 for returning the optical fibre 20 to be mounted on the inner face of the base 32 of the adapter tube 24. On leaving the end back of the projectile 12, the optical fibre 20 travels on the return pulley 36 and returns to the open front end of the launching tube 14, between the adapter tube 24 and the projectile 12, to then be directed to the command post (not shown).

More precisely, the part of the optical fibre 20 which travels between the adapter tube 24 and the projectile 12 passes in a sleeve (not shown) provided for this



purpose inside the adapter tube. This sleeve ensures mechanical and thermal protection of the optical fibre 20 during launch of the projectile 12.

5 The external ring 34 is fitted on one hand with hooking means 26 of the adapter tube 24 on the launching tube 12. In the embodiment shown, this other part of the hooking means 26 comprises two hooks 48 located in  
10 emplacements diametrically opposite on the surface external of said external ring 34. The dunking mechanisms 30 mounted on the retaining ring 22 are arranged so as to be able to engage in the hooks 48 when the adapter tube 24 is placed in the launching tube 14. The adapter tube 24 is then immobilised  
15 relative to the launching tube 14.

The external ring 34 is situated substantially in the centre of the adapter tube 24 and separates the latter in a first part 38, located in front of said external  
20 ring and a second part 40 located in back of said external ring.

The first part 38 of the adapter tube 24 comprises longitudinal guide grooves 42 (figure 2) whereof each  
25 is provided to receive one of the fins 16 of the projectile 12. More precisely, each of the longitudinal guide grooves 42 is formed in a longitudinal external groove 44 of the adapter tube 24 and is attached inside said tube over its entire length. In addition, the  
30 number and the distribution of the grooves 44 around the adapter tube 24 and the number and the distribution

of the fins 16 around the body of the projectile 12 are identical. In the embodiment represented, there are four fins 16 and four grooves 44, evenly distributed around the body of the projectile 12 and around the adapter tube 24, respectively. Each of the longitudinal guide grooves 42 likewise is attached at its front end, such that the projectile can be introduced into and withdrawn from the adapter tube 24 via the front of the latter.

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The front end of the first part 38 of the adapter tube 24 is reinforced by a segmented external ring 46 between the longitudinal external grooves 44.

15 The second part 40 of the adapter tube 24, situated at the back of the external ring 34, has a uniform external diameter, slightly less than the inner diameter of the launching tube 14 from which the projectile must be fired. Accordingly, the second part  
20 40 of the adapter tube 24 can be introduced via the open front end of the launching tube 14, after the retaining ring 22 has been mounted on the launching tube 14.

25 Because of the arrangement which has just been described in reference to Figures 1 and 2, it is possible to launch a projectile 12 guided by optical fibre 20 and fitted with external fins 16 which can fold but not extended inside the body of the  
30 projectile, from a launching tube 14 not provided to

this end, without any modification to said tube.

This result is made possible due to the utilisation of an adapter tube 24 serving as interface between the projectile 12 and the launching tube 24 and due to assembly of a retaining ring 22 on the launching tube 14, the adapter tube 24 easily able to be fixed to the retaining ring 22 by the hooking means 26.

10 The grooves 44 formed on the part front of the adapter tube 24 are utilised to ensure the guidance of the folded fins 16 of the projectile 12, during its launch. The trimming propulsion units 18 are then placed before the segmented external ring 46 which delimits the front end of the part front of the adapter tube 24. The jets 15 emitted by these propulsion units 18 then rest on said ring 46 during firing.

As illustrated in Figure 3, the ensemble formed by the projectile 12 and by the adapter device 10 is provided 20 to be easily transported to the launch site, where the launching tube 14 is located.

For this purpose, the adapter device 10 further 25 comprises a front protective cap 48, provided to be placed on the end front of the projectile 12, a protective cap back 50, provided to be placed on the back end of the adapter tube 24, closed by the base 32, and a transport sling 52, which connects the protective 30 front 48 and back caps 50. The caps 48 and 50 form with the sling 52 mobile transport elements of the ensemble

made up by the projectile 12 and its adapter tube 24. These mobile transport elements are discarded on arrival at the launch site.